Instructional Manual *for* HUMAN MAZE LEARNING

HML-BV

Dr. Vivek Bhargava
Secretary
Harprasad Institute of Behavioural Studies
41-42, Hardeep Enclave, Sikandra
AGRA (U. P.)

T. M. Regd. No. 564838

An ISO 9001 : 2008 Certified Company

ISBN : 978-93-85002-88-5

Estd. 1971 www.npcindia.com ☎: (0562) 2601080

NATIONAL PSYCHOLOGICAL CORPORATION

UG-1, Nirmal Heights, Near Mental Hospital, Agra-282 007

Problem

To study the nature as well as progress in Learning through Maze Learning.

Introduction

Definition

(1) J. P. Guilford (1956)–*"We may define the term very broadly in saying that Learning is any change in behaviour resulting from behaviour".*

(2) Hilgard and Atkinson (1967)–*"We may define Learning as a relatively parmanent change in behaviour that occurs as the result of practice".*

Types of Learning

(1) Verbal Learning, (2) Motor Learning.

Effecting Factors of Learning

(a) Psychological Factors–Motivation, Intelligence, Sex, Aptitude, Emotional Situation, Maturity.

(b) Physiological Factors–Glands, Sensory organs.

(c) Environmental Factors.

Theories of Learning

(1) Thorndike's Theory of Learning.

(a) Laws of Readiness, (b) Laws of Effect, (c) Laws of Exercies.

(2) Pavlov's Classical Conditioning Theory of Learning.

(3) Skinner's Operant Conditioning Theory of Learning.

(4) Hull's Reinforcement Theory of Learning.

(5) Gestalt's Theory of Learning.

(6) Guthrie's Contiguity Theory of Learning.

(7) Tolman's Theory of Learning.

Method of Learning

(1) Whole *vs* Part Method.

(2) Massed *vs* Distributed Method.

(3) Active *vs* Passive Method.

Historical Background

Learning is perhaps the most important area in modern experimental psychology The real laboratory experiment started with works of *Thorndike, Pavlov, Bechterev, Watson* and others. It may be interesting to note that in the early stages most of the experimental work on learning was done on animals. Even today a large amount of experimentation on animal learning is going on. The findings of these animal experiments have been helpful in working out experimental designs and hypotheses of experimentation with human beings.

Among the psychologists working in the field, each one has one's own particular way or theory of explaining the learning process. According to Thorndike, all learning takes place by the method of trial and error. In connection with this, he formulated three laws–The law of exercise, the law of recency and the law of effect. According to *Pavlov* and several behaviouristic psychologists all learning takes place by what they call conditioning. Pavlov, basing on his dogbeel experiment, explains all learning as resulting from the formulation of stimulus-response associations between various stimuli and responses. More complicated learning accroding to him results from generalisation and discrimination.

Later psychologists like Hull and Skinner though accepting the basic principle of conditioning emphasise certain other factors like drive, reward, etc. in explaining the learning process. Their approach is known as instrumental conditioning as opposed to Pavlov's classical conditioning.

A third group of psychologists mainly belonging of the *Gestalt* School disagreee with the above approaches and stress the importance of what they call 'Insight'. Some psychologists like Tolman, take an intermediary position and accommodate both conditioning and insightful learning. The Bulk of the psychologists today, however, agree that learning of different types of skills cannot be explained by any single theory. They recognise more than one type of learning, like sign learning, response learning, etc.

Experiments in the field of learning have used a wide variety of material some involving motor and muscular behaviour and others involving language. Among the well-known pieces of apparatus that have been devised for the learning experiments are different types of mazes, the Skinner problem box, the Lashelv jumping stand, the Yerkes multiple choice apparatus etc.

Haught, in 1921, described a maze consisting of bolt-heads through which was connected an unseen pathway. Barker, reported in 1931, a maze which the called a 'stepping-stone' maze. This consisted of pathway electrically connected through a series of bolt-heads. A simple wiring device enabled the pattern to be altered very rapidly. Tolman, Hall, and Bretnall, in 1932, used a punch-board maze consisting of 30 holes. In 1934, Muenzinger repeated a similar experiment substituting of bolt-heads for the punch-holes. Gurnee, in 1937, described a portable bolt-head maze of similar desing. A summary of many of the studies of maze learning is given by Woodworth.

In his 1937 APA presidential address, the noted neobehaviorist Edward Chace Tolman, PhD, made a startling claim: "Everything important in psychology...can be investigated in essence through the continued experimental and theoretical analysis of the determinants of rat behavior at a choice-point in a maze."

Even in its day, this was quite an assertion : psychology boils down to what makes a rat trun left or right in a maze. Tolman was known to overstate the case for effect, but the quote does say something about the importance of maze learning to psychological scientists in the 1930s.

What are the origins of this iconic apparatus, and how did the maze come to be held in such esteem ?

Most historians agree that the animal maze was first developed at Clark University in the late 1890s, in the laboratory of Edmund Sanford, PhD, in a study by his graduate student, Willard Small. At about the same time, Edward Thorndike, of cats-in-puzzle-boxes fame, had been experimenting with baby chicks in maze-like devices (he called them "pens") constructed by placing books on end in various configurations, but the Clark experiments were the first real maze studies. They launched a rats-in-mazes tradition that continues to this day.

The idea for the first maze study was sparked by a conversation between Sanford and another Clark graduate student, Linus Kline, Small and Kline were both interested in the then-new Darwin-inspired field of comparative psychology. They had been studying rats and were especially interested in what they called the rat's "home-finding" ability, Kline told Sanford he had observed "runways...made by large feral rats to their nests under the porch of an old cabin on [his] father's farm in Virginia. "When these runways were exposed during an excavation, their maze-like appearance immediately suggested to Sanford using the Hampton Court Maze design to study "home-finding."

At that time, the Hampton Court Maze in England was a popular tourist stop, arguably the world's most famous hedge maze. It was part of the sprawling attraction of Hampton Court, just outside London, built as a home away from throne for the British royal family. Built in 1690, the maze consists of twists and turns and six-foot-tall hedges that continue to perplex visitors today. At the time of his conversation with Kline, Sanford had just returned from London; it is conceivable that he had visited the maze on that trip.

Whatever the origins of Sanford's suggestion, the Clark lab soon had its own mini-version of the Hampton Court Maze, redesigned slightly to make it rectangular instead of trapezoidal. The 6' x 8' maze had a wooden floor and wire mesh walls. Small became the lead researcher on the project when Kline had to step away for other research. In 1899, Small began his research, publishing his results two years later. This was a time when psychology was the science of mental life, so it is not surprising that Small described his maze study in "mentalistic" terms, rather than in the kind of language one might expect to read in a more modern "learning" study. So instead of reporting results in terms of error rates and time to completion, Small tried to infer what the rats were doing as they made their way through the maze.

Although Small was criticized by Thorndike for being overly anthropomorphic, his results make for fascinating reading. For example, describing a rat almost making a wrong turn, he wrote that the rat "hesitated as if 'scratching his head,' then entered this [dead end path] slowly and doubtfully–only a few steps, however; then with a sudden turn and a triumphant flick of his tail he returned to the correct path" (Small, 1901).

Despite the anthropomorphism, Small made important observations that were verified by subsequent studies. For instance, two of his rats were blind, yet they learned then maze just as easily as their sighted compatriots.Small's conclusions that vision was not needed to learn the maze, and that learning resulted from "the gradual establishment of direct associations" between maze stimuli and motor responses (Small, 1901), were supported a few years later in a famous series of studies by behaviorism's founder, John Watson.

Maze learning turned out to be more complex than either Small or Watson thought, but Small's work is less important for its conclusions than for the fact that it initiated a flood of research using mazes. Over the next few decades, versions of the Hampton Court Maze and many variations of it appeared throughout the academic landscape,

as research psychologists used the maze to explore the basic processes of learning. Rats weren't the only subjects making their way through the twists and turns; Human maze studies began appearing, ranging from simple table-top devices that blindfolded humans tried to learn by running a stylus through grooves cut into wood, to human-size mazes in the spirit of Hampton Court.

One such study was attempted by E.G. Boring, psychology's famous historian. As a graduate student at Cornell, the center of Titchenerian introspective psychology, Boring constructed an outdoor maze similar to the Hampton maze but with a circular design ("walls" were created with wooden stakes and wire). Blindfolded, Boring and several fellow grad students wound their way through the maze, rattling off introspective reports about the experience as they went along. They even tied sacks of flour to their backs with holes piercing the bottom so they could later trace their progress (if only they had taken pictures).The results were inconclusive. Boring later said that the main outcome of his only maze study was that the fell in love with one of his fellow maze-running colleagues, Lucy Day, whom he eventually married.

Mazes reached their experimental heyday in the 1930s and 1940s, when Tolman could claim that rat behavior at a choice point was the key to psychological knowledge and not be laughed off the stage. In those days, mazes were the apparatus of choice in the battles among competing learning theorists (e.g., Tolman, Hull). Today, mazes continue to be used by experimental psychologists. The goal is no longer to understand maze learning perse; rather, the maze is just another useful tool for examining such topics as drug effects and spatial memory.

Yet the maze holds an exalted position in psychology's history, thanks to Kline's comments about rats burrowing under a porch, Sanford's knowledge of Hampton Court, and Small's landmark study.

The T-maze is one of a group of various mazes of differing sizes and many shapes. [2] It is one of the most simple, consisting of just two turns – right or left. The maze is only able to be altered by blocking one of the two paths.The basis behind the T-maze is to place the rat at the base of the maze. By placing a reward at one arm or both arms of the maze, the rat must make the choice of which path to take. The decision made by the rat can be a cause of a natural preference within the rat. A study of alternation can be performed by repeating the experiment multiple times with no reward in either arm of the maze. Another experiment that can be performed is the alternation

of rewards each time the experiment is performed, proving the rat will choose the arm that was not visited each time the experiment starts.

Rewards within the rats can be types of food, another rat within a cage, an odor, or a type of shelter. By performing this type of experiment, the rat's preferences can be determined. Examples of this could be a rat's food preferences, its familiarity with specific smells and scents, the attraction of the male and female within the maze, and whether a young rat prefers an adult female or an adult male. These simple experiments can determine the rat's psyche on multiple subjects, and ultimately divulge further into the rat's psychological characteristics. It is also important to consider the rodent's behaviour. The use of spatial and non-spatial cues is very influential to research findings on memory, spatial learning and the long-term potential (LTP). These cues include the orientation of the maze, extra-maze cues and room configuration cues. Strategies may be affected by the rodent's ability to find cues in the room, the presence of absence of polarizing cues in the room, and the stability of the maze in the room. When analyzing and interpreting experimental data, researchers have to consider the orientation and configuration of the apparatus and cues in the room.

Hypothesis

There is a positive effect of practice on learning process.

Variables

(a) Independent–Unknown route of Maze.

(b) Dependent–Response of subject (in the form of quantity of time and errors.)

Material Required–Different Types of Maze

Finger Maze (Wooden Make) (T-Shape)

Finger Maze (T-shape) is of square in shape and its tracks are of groove type. There are three tracks in it out of which only one leads to the aim. In this, aim is achieved with the help of fingers. Going on the wrong track is an error.

Maze Learning (Simple Aluminium Make) with Stylus

This is rectangular in shape. In this also routes are grooved. In this stylus is of Aluminium, going on wrong track is an error and there are three tracks out of which only one track leads to the aim.

Maze Learning T-Shape Electrical

This is also like finger Maze out it works on electricity and aim is decided by stylus. Bulb starts glowing while going on wrong track by which error can be known. Only one track leads to the aim out of the three tracks.

Maze Learning Pointed Electrical/Bolt

This is of square shape made of wood. In this are 15 rows and 15 columns, i.e 225 screws are fixed on the wood in the form of points which are connected with bulb and stylus. Bulb does not glow while going on right track but glows while going on wrong track by which error can be known.

Maze Learning Electrical Pointed with Reset Counter/Bolt

Working is like of Maze Learning Electrical (Pointed) but in this error can be known by Reset Error Counter alongwith the glowing of bulb. After every effort Error Counter is reset.

Maze Learning Electronic Pointed with Reset Counter/Bolt

The working of this type Maze is like that of Maze Learning Electrical Pointed with Reset Counter. Electronic Digital Counter is fitted in which gets reset also.

Time of every trail of Maze Learning is done with the help of Stop Watch/ Stop Clock.

Maze Learning Electronics with Digital Reset Error Counter and Timer with Manual

This Maze learning apparatus is the most advanced and latest version and ultra modern technologically. This tool operates on A. C. Mains. Subject places the stylus at the starting point of Maze Learning. The Digital Timer immediately starts recording Time in seconds and its decimal parts, And whenever there is an Error in Digital Error Counter automatically records one Error in Digital Form. Thus, here in this Instrument Time and Error both are recorded automatically. Both the Digital Timer and Digital Error Counter are Reset type and have Four (04) LED chips as Display.

Experimental Control

(1) Atmosphere was kept quiet, normal and convenient as far as possible.

(2) Subject was made understood well with instructions regarding experiment. How he has to work by touching the points of instrument or to proceed forward was made

clear by doing ownself (by touching only two-four points). But subject was not allowed to do pre-practice with the Maze Learning.

Experimental Instructions

Following instructions were given to the subject before starting the experiment :

(1) Start moving forward by touching different points of the Maze Learning by Stylus on hearing indication of 'Start'.

(2) During experiment you take stylus/finger on the point just above or below that point or point just on right or left from that point.

(3) You will not take stylus/finger on any point or transversely.

(4) You will not leave any point while doing work.

(5) You have to move forward by touching only those points by which bulb does not glow.

(6) If bulb glows on touching any point by stylus, bring back stylus to that immediate point from which you lifted the stylus.

(7) During different efforts of the experiment you have to work as above and have to reach that last point line on which 'aim point' (end) is written by touching right points (bulb not glowing) with the stylus.

(8) During experiment keep strict sight on glowing of bulb. Write your that error 0.1 which bulb glows on touching the point.

Experimental Method

First of all subject kept his stylus/finger on starting point and started efforts for reaching the aim. In finger maze (wooden) error was noted on finger touching the boundry of grooved track or going on wrong track and in maze simple this action was repeated with stylus. Similar action was repeated in Maze T-shaped Electrical. In other, Maze (Maze Learning pointed electrical. Maze Learning electrical with reset counter, Maze Learning electronic with reset counter) error was noted on glowing of bulb or by counter. In pointed maze we moved right or left and above or below on glowing of bulb not transversely. Similarly 20 efforts are done.

Results Table

Trial	Time (Sec.)	Errors	Trial	Time (Sec.)	Errors
1			11		
2			12		
3			13		
4			14		
5			15		
6			16		
7			17		
8			18		
9			19		
10			20		

Statistical Analysis

Mean of First Three Trials of Time $M = \frac{\Sigma X}{N} =$

Mean of Last Three Trials of Time $M = \frac{\Sigma X}{N} =$

Mean of First Three Trials of Error $M = \frac{\Sigma X}{N} =$

Mean of Last Three Trials of Error $M = \frac{\Sigma X}{N} =$

Interpretation and Discussion

The main aim of this experiment was to know the effect of practice on learning process for which maze learning was used. On the basis of this, mean of time of first three trials of subject came to be.....and mean of time of last three trials came.....and mean of subject's error of first three trials came.....and mean of last three trials.....On the basis of this is can be predicted that as the subject practice's time and error in his trials decrease.

Conclusion

Accroding to the results, we accept / reject our hypothesis.